Public private partnerships in peatland management: A design for sustainable practices

Zulkarnaini Zulkarnaini[1*], *Mimin Sundari* Nasution[2], *Rinto* Rinto[2], *Geovani* Meiwanda[1], and *Hafzana* Bedasari[1]

[1]Public Administration, Faculty Social and Politic Science, Universitas Riau, Indonesia
[2]Regional Planning, Research and Development Agency of Bengkalis Regency, Indonesia

Abstract. This research endeavors to craft a pioneering peatland management model rooted in the principles of public-private partnership within Riau Province. Employing a descriptive qualitative research method, we conducted data collection through a multifaceted approach, encompassing interviews, comprehensive literature analysis, and secondary data sources. Our data analysis methodology employed an interactive model inspired by the dynamics of collaborative governance, as proposed by Emerson and Nabatchi. The outcomes of this study underscore a recurrent stumbling block in Riau's peatland management: the paucity of active and robust collaboration between the government and the private sector. While the government functions within its defined boundaries, the private sector often devises programs that align with the interests of specific interest groups. This frequently results in program overlap, partial initiatives, and incidental strategies. Furthermore, the prevailing disconnect between government and private sector entities raises concerns about the future implementation of sustainable practices in peatland management.

1 Introduction

Peatland conversion is very massive in various regions in Riau Province [1]. The agriculture and plantation sectors are the sectors that experience the most conversion. Peatland conversion is actually common in a region that is aggressively developing. The problem is that this activity is more motivated by short-term economic interests [2]. Long-term environmental considerations are often ignored. What then happens is a number of failures and losses experienced by the community and also the surrounding ecosystem, especially adverse impacts in the fields of ecology and health [3]. The haze that often appears during the dry season is one of the inevitable impacts of poorly planned and managed peatland conversion.

Communities living around peatlands in Riau are highly dependent on the local ecosystem. They not only live on peatlands, but also depend on them for their livelihoods. That's why their existence can play a dual role: as guardians and destroyers of the ecosystem [4]. Irresponsible peatland management not only causes damage to the ecosystem itself, but

* Corresponding author: zulkarnainifisip@lecturer.unri.ac.id

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also causes damage to the resources contained therein. The wider impact, of course, will reduce the welfare of the people who depend on the ecosystem [5].

The fact in Riau is that peatland management has often failed, both by the government and the private sector. One of the reasons for this is because the programs carried out by the government and the private sector only focus on restoring the ecological functions of peatlands and ignore aspects of community empowerment [6]. The government works with its own functions while the private sector creates programs based on the interests of its groups. It is not uncommon for programs to overlap or even be partial. It is not surprising then that data shows that almost 60% of peatlands in this area are damaged. In the future, a peatland management model is needed that can truly ensure the sustainability of the ecosystem and minimize the potential for disaster.

The extent of degraded peatlands and other problems that arise as a result of the continuing fires deserve serious attention from various parties [7]. A comprehensive approach to participatory and sustainable peatland management and the continuity of the coordination process between related institutions must be considered. For this reason, this research focuses on sustainable peatland management policies based on public private partnerships.

The study of peatland degradation has gained attention over the past few decades. Degradation is closely linked to conflicts over natural resource management, which are increasing in scope and intensity, making their resolution very difficult [8]. Such conflicts can explain the different interests, strengths and vulnerabilities of different social groups based on concerns for social justice in their utilization [9]. In addition, the government has failed to find a solution and the private sector has failed to find the right space to participate.

The novelty of this research lies in the approach used to develop a policy design for peatland management based on public-private partnerships. The formulation of this design requires a special study of peatland management with a broader scope and using a multidisciplinary approach. Through this approach, it will be possible to formulate the roles of policy actors to solve peatland management problems from various contextual scientific aspects, including ecological, social, economic, institutional and technological aspects.

2 Method

The initial stage of this research was carried out to photograph thoroughly and comprehensively the conditions and problems, especially with regard to peatland, then formulate a model design based on these conditions. The main aspect of focus is identifying or mapping the interaction of biodiversity with peatland and the key elements/factors that influence them. Then proceed with identifying the needs of peat peatland managers according to their priority scale. Primary data were collected through field observations and in-depth interviews with informants from the Local Government, PT. Pertamina RU II Sungai Pakning, Non-Governmental Organizations (NGOs), and other local *stakeholders.* To determine sustainability and peatland management policies, computer programming is used which is analyzed statitistically descriptively and uses certain *tools.*

The preparation of sustainability attributes based on five attributes, namely: 1) land conversion rate, 2) Knowledge of the importance of conservation, 3) soil fertility level, 4) Knowledge of peat function, and 5) land use for tourist areas. Each attribute on each dimension is given a score based on the *scientific judgment* of the scorer. The score range ranges from 0; 1; 2 or depending on the state of each attribute, which is interpreted as ranging from bad to good. The score results of each indicator are analyzed with *multi-dimensional* to determine one or more points that reflect the sustainable position of sustainable management development studied relative to three reference points, namely good, medium and bad points. The definitive score is the mode value, which is analyzed to determine the points reflecting

the sustainability position of management indicators that affect sustainability with the MDS statistical ordination technique. The approximate score of each dimension is expressed on a scale of worst (*bad*) 0% to best (*good*) 100%. The score value which is the value of the sustainability index of management of each dimension can be seen in the following Table 1.

Table 1. Category sustainability peatland.

Index Value	Category
0.00 – 25.00	Bad (not sustainability)
25.01 – 50.00	Less (less sustainability)
50.01 – 75.00	Enough (enough sustainability)
75.01 – 100.00	Best (very sustainability)

3 Result and discussion

To determine the status sustainability in the protection policy of peatland, Riau Province, the attributes that are estimated to be influential are: 1) land conversion rate, 2) Knowledge of the importance of conservation, 3) soil fertility level, 4) Knowledge of peat function, and 5) land use for tourist areas. The results sustainability analysis (RAPPEAT) in the management policy of peatland, Riau Province obtained a sustainability index of 50.5% or classified as a slightly continuous category (>50). This value illustrates the condition of the peat arboretum ecosystem is still experiencing pressure from its aspect. This is reinforced by the results of field observations that illustrate that the peatland ecosystem has begun to experience damage and decline in quality such as land conversion and land use for tourist areas.

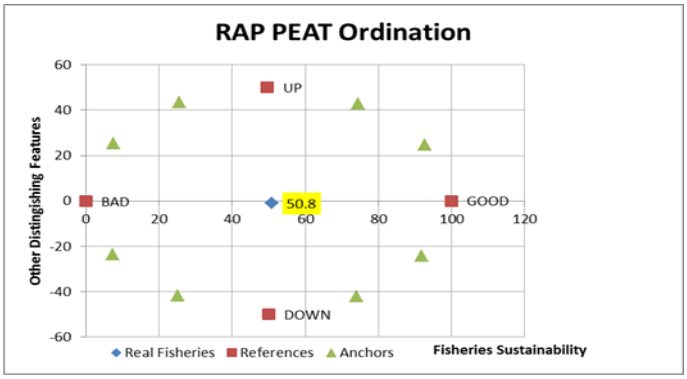

Fig. 1. Peatland sustainability index.

In addition to obtaining a sustainability index, RAPPEAT analysis also produces *output* in the form of *leverage of attributes*. Leverage analysis aims to see the sensitive attributes that influence the value of the sustainability index. In addition, leverage attributes are attributes that provide the highest percentage value in the sustainability of a dimension. Based on *leverage* analysis, two attributes that are sensitive to sustainability index values are obtained, namely (1) land conversion rate (RMS = 2.34), and (5) land use for tourist areas (RMS = 2.27). These two attributes provide direction for interpretation that the condition of peatland ecosystems is strongly influenced by tourism activities. The RMS value indicates the magnitude of the role of each attribute on sustainability status sensitivity. In other words,

the higher the RMS value, the greater the effect of that attribute on sustainability sensitivity. While three other attributes, namely (2) knowledge of the importance of conservation (RMS = 0.19), 3) soil fertility level (RMS = 1.14), and 4) knowledge of peat function (1.12), had little effect on sustainability sensitivity.

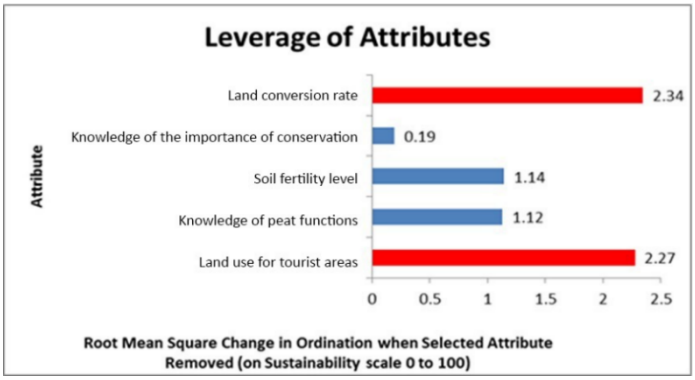

Fig. 2. The role of each attribute of the peatland expressed in the form of rms value.

Figure 2 shows that the attributes of land conversion rate and land use for tourist areas have high sensitivity, this is due to the occurrence of land use change for tourism activities. This condition is in line with the fact that the management of peatland in Indonesia in general and Riau Province in particular faces a number of challenges and problems that need to be addressed to ensure their effectiveness and sustainability. Peatland began to experience land damage due to various human activities such as forest burning, encroachment, or land conversion for tourism and also agricultural activities. This damage can threaten the sustainability of the peatland and reduce the conservation value ofits habitat.

Based on the trend, peatland fires in Riau Province from year to year occur in the same area or in the vicinity of the previous incident. These fires occur not only on company-owned land, but also on community plantations. However, the extent of degraded peatlands and the problems that arise as a result of the fires that continue to occur have not received serious attention from various parties [10]. The considerations used by decision-makers in peatland management have not prioritized participatory and sustainable peatland management, related to conservation, rehabilitation and restoration efforts.

Peatland management policy in Riau Province cannot be separated from the concept of sustainable development [11]. Sustainable development requires harmony between ecological (environmental), economic and social dimensions. So far, there is a large gap between these three aspects in the development and utilization of peatlands. The economic benefits obtained have not been followed by sustainable (ecological) land management. This has caused the peatlands to become ecologically degraded, resulting in low land productivity [12]. An integrative approach to ecological, social economic, institutional and technological factors has not been reflected in peatland management.

The problem is that there does not appear to be equal cooperation between the government and the private sector. The unequal power relations between the government and the private sector in the case of peatland management can be traced back to the long history of forest clearing for economic development [13]. The increasing incidence of fires in peatlands is closely related to the expansion of forest and land-based industries, such as the expansion of the timber industry since the 1970s and the expansion of oil palm plantations since the 1990s. The political economy dimension of peatlands, where the increasing need for land for oil palm plantations is influenced by the increasing demand for palm oil products from the global market.

Fires that occur in peatlands are due to the process of forest clearing on a large scale, which is driven by the economic motives of companies to clear land by burning, as well as factors related to development policies that are exploitative of natural resources [14]. Peatland fires have political dimensions and implications, where actors such as the government have the power and the private sector with capital to determine the pattern and direction of natural resource utilization. Meanwhile, community members are the weakest party and become victims of the impacts caused. Peatland fires ultimately become an arena for contestation of political interests from the roles, influence and interests of the actors involved.

Policy makers do not seem to realize that peat soils have very different characteristics from other soils, so their management cannot be equated. The main thing is that it should take into account the specific characteristics of peatlands, both in the vertical and horizontal dimensions, in a coordinated cross-sectoral institution [15]. It is also important to support strict and complete policies and regulations with attention to commodity selection and adaptive conservation aspects. Another thing is the use of specific technology that can be applied in accordance with the carrying capacity of peatlands, and refers to local wisdom [16].

Public private partnerships (PPPs) are key to sustainable peatland management. The government can work with private companies in organizing training programs for farmers and breeders operating around peatlands. This training could include environmentally friendly farming techniques and sustainable livestock management practices. The government can initiate a peatland restoration program, and private companies can support it with funds and manpower [17]. This restoration includes replanting peat vegetation that has been lost.

This chasm of cooperation between the government and the private sector poses a formidable challenge. It casts a shadow of uncertainty over the prospects of implementing sustainable practices in peatland management, thereby endangering the ecological integrity and economic viability of these landscapes for future generations. The stakes are high, for the protection and restoration of Riau's peatlands are not merely regional concerns but global imperatives in the face of climate change and biodiversity loss.

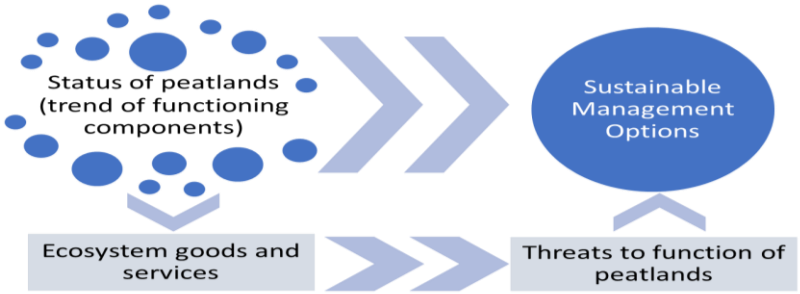

Fig 3. Important aspects of peatland management based on PPPs.

Figure 3 shows the design of a management model that considers all components, including local resources found in peatland ecosystems. The design is a consideration for relevant parties to explain the processes that have led to the lack of proper peatland management, which has had a negative impact on the surrounding environment. Through this design, an integrated peatland management policy can be formulated, involving all relevant elements. However, it must be remembered that the government and the private sector are the dominant actors.

Public private partnerships are very possible because the existence of peatlands currently concerns the livelihoods of many people. The main objective of these partnerships is to

combine resources, expertise and interests from both sectors to create more efficient, innovative and sustainable projects or services [16]. In this partnership, both parties share the responsibilities, risks and rewards associated with a particular peatland management project or service [17]. The government plays a role in regulating, supervising and providing the right regulatory framework, while the private sector contributes capital, technology, management and operational expertise.

Peatlands, with their extraordinary natural wealth, have become an integral part of the ecosystem in Riau Province. However, peatland management is not an easy task. Land clearing practices for agriculture, plantations and other human activities often result in peatland degradation, resulting in the release of greenhouse gases that are detrimental to the environment [18]. This is why serious efforts are needed to manage peatlands wisely. Their sensitivity to environmental change and their role in mitigating the impacts of climate change make them a challenge that requires collaboration between the government and the private sector.

Public-private partnerships in peatland management have significant benefits. Through collaboration, peatland management can become more sustainable, reducing deforestation and carbon release. The private sector can play a role in regional economic development through investment and job creation. The government can ensure that private companies comply with strict environmental regulations, thereby reducing their negative impacts on peatlands. Cooperation between the government and private sector in peatland management is an important step in safeguarding this valuable ecosystem for future generations. With a shared commitment, we can achieve sustainability goals and protect the natural environment.

4 Conclusion

Peatland management in Riau Province faces substantial challenges due to the lack of cooperation between the government and the private sector. However, the research underscores the potential for improvement through a well-structured PPP model that fosters collaboration, clear governance, community engagement, and education. Implementing these recommendations can lead to a more sustainable future for Riau's peatlands, preserving their ecological significance and economic viability for generations to come. The findings of this study hold relevance not only for Riau but also for other regions grappling with similar peatland management dilemmas, contributing to the global effort to protect these invaluable ecosystems.

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